
The Impact of Financial Crisis and Audit Quality on Earnings Quality:
Evidence from EU

Daniela do Souto Machado

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Supervised by
PhD Professor António de Melo da Costa Cerqueira
PhD Professor Elísio Fernando Moreira Brandão

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Biographical Note

Daniela do Souto Machado was born in Paredes, Porto, in 1995.

In the year of 2013, she began studying Economics at the School of Economics and Management of the University of Porto (FEP) and graduated in 2016.

In September 2016, she joined the Masters' degree in Finance and Taxation at the same institution, in which she presents the following master's thesis.

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Abstract

This study examines the combined impact of the 2008 financial crisis and audit quality on earnings quality in EU listed firms. Our sample includes data from 14 European listed firms over the period from 2006 to 2016, covering the period before, during and after the crisis. The absolute value of discretionary accruals is used as a proxy of earnings quality by using the Kothari et al. (2005) model.

We find that firms present higher earnings quality in the crisis period than in the previous period. In addition, empirical evidence shows better earnings quality in the post-crisis period relative to the crisis period. Overall, we find that earnings quality after the crisis is even better than before the crisis.

Furthermore, our results support the argument that Big 4 audit firms constrain earnings management more than non-Big 4 auditors. However, a relevant finding is that the differential impact of Big 4 auditors relative to non-Big4 on constraining earnings management practices decreases over the analysis period. It appears that non-Big 4 auditors have enhanced their practices during the financial crisis, so that the differential impact of two types of auditors becomes apparently no significant in the post-crisis period.

We conduct a number of robustness tests either by using signed discretionary accruals or by running our tests based alternative subsamples.

Keywords: Earnings quality, financial crisis, audit quality, discretionary accruals

JEL Classification: G01, M41, M42

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1. Introduction

The financial statements are of high importance for several stakeholders since they are the main source of information and the basis of the decision-making process (Kousenidis et al., 2013). Auditors play an important role in ensuring the quality of financial reporting, helping investors to take more informed decisions. However, in recent years, both earnings quality and the role of the auditors have been questioned with the emergence of the most recent financial crisis of 2008. In this research, we investigate the joint impact of 2008 financial crisis and audit quality on earnings quality in EU listed firms.

Previous studies provide empirical evidence of the effect of the recent financial crisis on the financial reporting strategy (e.g. Arthur et al. (2015); Filip and Raffournier (2014); Iatridis and Dimitras (2013); Kousenidis et al. (2013); Persakis and Iatridis (2015)). The financial crisis implies that firms face increased difficulties, lower and more volatile earnings, poor performance, financial problems and also a lack of investor confidence. Given this scenario, managers can be led to manage earnings as a way to mask the negative effects of the financial crisis. However, the financial crisis may also have a positive effect by encouraging managers to increase the transparency of financial reporting in order to increase investor confidence and attract potential investors.

Also, as a result of the financial crisis, many financial institutions went bankrupt and they were not provided adequate warning beforehand by auditors, particularly the Big 4 (Shahzad et al., 2018). Being the Big 4 auditors considered auditors who provide high-quality audit services thus ensuring the quality of financial reporting, it is important to note whether audit differentiation between Big 4 and non-Big 4 auditors remains in the presence of adverse economic conditions.

Therefore, following the study of Arthur et al. (2015), we analyse the impact of the financial crisis on earnings quality in 14 EU countries. However, this study goes a little further than the study of Arthur et al. (2015) and other studies that analyse the impact of the crisis in European Union. This research analyses not only the period before and during the financial crisis but also the period after the crisis, which is a limitation and a suggestion for future research in some studies (e.g. Arthur et al. (2015); Persakis and Iatridis (2015)); and also analyses the impact of audit quality on earnings quality during these different periods of analysis (pre-crisis, crisis and post-crisis).

Since the beginning of the financial crisis the European Union has developed substantial efforts to minimize its effects and to prevent potential future crises. Then, as a result of the implementation of various measures, a stronger and more capable European Union is foreseen, which leads us to expect a higher earnings quality after the crisis than before and a higher audit quality.

To perform our analysis, we collect data from listed firms in 14 European countries over the period from 2006 to 2016. Therefore, the magnitude of discretionary accruals (measured using the estimated residuals from Kothari et al. (2005) model) is used as a proxy of earnings quality since they capture the management discretion. Our findings indicate an earnings quality improvement during the financial crisis period comparing with the pre-crisis period, suggesting that managers had incentives to improve earnings quality in order to increase investor confidence and to attract potential investors. Moreover, we also report that during the post-crisis period, the earnings quality was even greater than it had been in the crisis period. Overall, the earnings quality was higher in the post-crisis period than in the pre-crisis period. This result may be due to the various measures implemented in the EU to combat and prevent future crises. Regarding to the impact of audit quality, the firms audited by one of the Big 4 exhibit higher earnings quality when compared to firms with non-Big 4 auditors. However, in the post-crisis period there is no significant difference in quality provided by Big 4 and non-Big 4 auditors. This may be the result of improved auditing practices by non-Big 4 auditors due to the implementation of various audit-level measures in the EU. Our results are partially robust after taking into account the sign of discretionary accruals and for two alternative subsamples.

This research contributes to the prior literature in several ways. First, the fact of analysing the earnings quality during an economic downturn, a period of non-normal economic conditions, is already a contribution to previous literature on earnings quality. Secondly, our analysis is done for a large sample of listed firms from 14 European Union countries. Thirdly, this study extends the previous research on earnings quality during the crisis using a long time period of analysis (from 2006 to 2016) which allows us to analyse the periods before, during and after the crisis. According to my knowledge, there is no research that does this analysis for the periods before, during and after the financial crisis in European Union. Prior literature only analyses the crisis period comparatively with the pre-crisis period, or they are carried out in the Asian context. Finally, in conjunction with the

analysis of the impact of the financial crisis, we also examine the impact of audit quality on earnings quality and whether audit quality differentiation remains over the period of analysis, which involves macroeconomic changes such as the 2008 financial crisis.

The remainder of this dissertation is organized as follow. The next section displays a brief literature review of earnings quality, audit quality and the impact of financial crisis on earnings quality, as well as the hypotheses development. Next, in Section 3 are presented the variables definition and the empirical models used to analyse the research hypotheses. Section 4 describes the sample selection process and the descriptive statistics. Subsequently, Section 5 initially presents the descriptive analysis and correlation matrix, and then the regression results are presented and discussed, as well as the robustness tests. To finalise, Section 6 presents the conclusions of the study.

2. Literature Review and Hypothesis Development

2.1. Earnings Quality

In recent years, financial information and, specifically, earnings quality has received more and more attention from investors, creditors, regulators and researchers in different areas. Financial statements play an important role for several users since they are the main source of information for firm stakeholders¹. They provide users the relevant information to facilitate their decision making process (Kousenidis et al., 2013). Earnings are often used as a summary measure of the firms' financial performance for contracting, evaluating and monitoring purposes, and for investment decision making (Dechow, 1994; Schipper & Vincent, 2003). For instance, accounting earnings are used in debt covenants, capital raising and executive remuneration contracts (Ghazali et al., 2015). Therefore, it is in the interest of the stakeholders and the firms themselves to have a high quality financial statements, since they allow better performing firms to distinguish themselves from the others, they help to better resources allocation and decision-making process (Healy & Wahlen, 1999).

However, accounting literature does not provide an explicit way to define earnings quality. Dechow and Schrand (2004) consider high-quality earnings as those that accurately reflect the firm's current performance, that are a good indicator of future performance and accurately reflect the intrinsic value of the firm. Similarly, Dechow et al. (2010) define high-quality earnings as providing more information about the component of firm's performance that is more important for the decision-making process. According to Kousenidis et al. (2013), high quality earnings allows users of financial statements to make more efficient decisions and less risky in periods of financial turmoil, when there is greater market volatility.

Prior literature has also documented general evidence that earnings management erode earnings quality (Arthur et al., 2015; Healy & Wahlen, 1999), as it increases earnings opacity and information risk (Lin et al., 2014). According to Schipper (1989) earnings management is defined as the intentional intervention in the financial reporting process in an attempt to obtain some advantage from them. Similarly, for Healy and Wahlen (1999), earnings managements occurs when managers use their judgment to change financial

¹ According to Healy and Wahlen (1999), stakeholders are capital providers, regulators, bond-rating agencies, financial analysts, auditors, employers, suppliers and customers.

reporting either to mislead stakeholders about the true performance of the firm or to influence contractual outcomes that depend on the information presented in the financial statements. Then, we assume that the decrease in earnings quality is a consequence of the earnings management.

Firms' managers are responsible for preparing and disclosing accounting information, thereby benefiting from privileged knowledge about the firm. Given information asymmetry and the conflict of interests between insiders (managers and controlling owners) and stakeholders, managers have the chance to prepare financial information in the most beneficial way for them, to the detriment of the interests of external users (Ghazali et al., 2015). For instance, managers can use their discretion in preparing financial reports to exaggerate earnings and cover losses or, understate earnings in years of good performance, creating reserves for periods in the future in order to mask the variability of earnings and avoid outsider interference (Leuz et al., 2003).

Managers have several incentives to manipulate earnings. However, the effect of these different incentives on earnings has not a specific pattern (Iatridis & Dimitras, 2013). Some firms use income-increasing earnings management to avoid debt-covenant violation. If they are violated, the firm can see the interest rate being raised or the immediate repayment being required (DeFond & Jiambalvo, 1994; Healy & Wahlen, 1999). The earnings-based compensation of managers is also pointed out as one of the reasons for them to engage in earnings management (Healy, 1985; Healy & Wahlen, 1999; Watts & Zimmerman, 1990). Moreover, firms may manipulate earnings to meet or beat analysts' expectations (Khaled, 2005; Persakis & Iatridis, 2015) or to influence the stock price (Healy & Wahlen, 1999). Adversely, some firms may have incentives to use income-reducing earnings management, including minimizing political costs related with being too profitable (Khaled, 2005), reducing taxes payment and to obtain benefits either from the government or the industry (Healy & Wahlen, 1999).

2.1.1. Measuring Earnings Quality

There is no generally accepted measure for the earnings quality, however a variety of proxies have been developed in recent years (Khaled, 2005). Francis et al. (2004) classify earnings quality measures in two groups: accounting-based measures - accrual quality,

predictability, persistence and smoothness, and capital market-based measures - conservatism, timeliness and value relevance (Kousenidis et al., 2013).

A large part of the existing literature focused on accruals-based measures to study earnings quality. Earnings are composed of two components, total accruals and cash flows from operations. Total accruals are accounting adjustments to the firm's cash flows and can result from management discretion or from changes in a firm's economic environment (Healy, 1985). The main purpose of these accruals-based models is to separate total accruals in discretionary and non-discretionary accruals. Basically, non-discretionary accruals, also known as normal accruals, are related to the normal performance of the company. Meanwhile, the other portion of total accruals is discretionary accruals, or abnormal accruals, which capture the distortions induced by the application of accounting standards or by intentional intervention of managers to manipulate earnings (Dechow et al., 2010). A high level of discretionary accruals implies higher opportunity of earnings management and in consequence lower earnings quality (Bing et al 2014). Discretionary accruals are used as earnings management measure and they're defined as total accruals minus estimated non-discretionary accruals, where the latter can be derived from discretionary accruals models widely used in prior studies (for example, (Dechow & Dichev, 2002; Dechow et al., 1995; Francis et al., 2005; Jones, 1991; Kothari et al., 2005). Thus, discretionary accruals are estimated as the residuals from these cross-sectional models (Arthur et al., 2015; Chen et al., 2010).

In her approach, Jones (1991) used the discretionary accruals to measure earnings manipulation, where the changes in total accruals are due exclusively to changes in discretionary accruals, because non-discretionary accruals remain constant. Jones (1991) defines the accrual process as a function of revenues and PPE (property, plant, and equipment). Revenues are used to control changes in the company's economic environment because they are an objective measure of company's operations before manipulations and PPE to control total accruals related to non-discretionary depreciation expense. However, the Jones model assumes that all changes of revenues are non-discretionary (i.e., they are not manipulated). In an attempt to overcome this limitation, Dechow et al. (1995) assumes that all changes in credit sales are resulted from earnings management. Thus, changes in revenues are adjusted for changes in receivables. In turn, Kothari et al. (2005) argue that discretionary accruals models might be misspecified when

applied to samples of firms with performance out of the normal. In this way, they suggest that performance-matched discretionary accruals capture better earnings management than traditional models. As such, they included the return on asset (ROA) variable to control the impact of performance on estimated discretionary accruals. In this sense, the model used in this study to determine earnings quality is the modified Jones model with control for performance from Kothari et al. (2005).

From another perspective, Dechow and Dichev (2002) developed a measure of the accruals quality based on past, present and future cash flows. According to the authors, accruals quality is measured through the working capital equation error, where a higher standard deviation of the residues means lower earnings quality. However, Francis et al. (2005) modified Dechow and Dichev model by including the change in revenues and the PPE as explanatory variables and to distinguish between accruals quality driven by economic fundamentals (innate component of accruals quality) versus management choices (discretionary component of accruals quality).

2.2. Financial Crisis and Earnings Quality

According to prior literature about the impact of the 2008 financial crisis² on earnings quality in the EU context, it is noted that financial crisis had a significant impact on firm's financial reporting strategy. A period of economic recession is usually characterized as a period of economic turbulence; where market uncertainty is greater than in normal economic periods, investor confidence decreases, firms experience a poor performance and several financial distresses, and earnings tend to be more volatile, to show a decreasing pattern and to incorporate more losses (Kousenidis et al., 2013). Nevertheless, the effect of the financial crisis on earnings quality is unclear. Some studies argue that, in such periods, firms have more incentives to increase the quality of financial reporting, e.g. to enhance investor confidence or due to increasing monitoring. On the other hand, it is argued that firms have incentives to manipulate their earnings during this period in an attempt to mask the negative effects of the crisis, perhaps because of their worst financial

² The financial crisis began in 2007 in the USA, but only in 2008 reached its peak with the failure of several financial institutions (Lehman Brothers, Merrill Lynch, Fannie Mae, Freddie Mac, Washington Mutual, Wachovia, Citigroup and AIG). However, the consequences of the crisis began to be felt in Europe mainly in 2008 (Filip & Raffournier, 2014). As such, the period 2006-2007 is considered pre-crisis period, 2008-2012 the crisis period and 2013-2016 the post-crisis period.

performance, lower earnings and share price (Arthur et al., 2015; Filip & Raffournier, 2014).

Some studies, such as those of Iatridis and Dimitras (2013), found a decrease in the quality of financial reporting during periods of economic recession. These authors investigated how the financial crisis affected the earnings management and the value relevance of financial reported earnings for listed firms that are audited by a Big 4. The study focused on the five European countries most affected by the crisis: Portugal, Ireland, Italy, Greece and Spain. The authors found that Portugal, Italy and Greece engaged more in earnings management in the crisis period than in pre-crisis period perhaps to improve their low profitability, and accommodate their higher debt and growth.

Persakis and Iatridis (2015) also investigated the impact of the 2008 Global Financial Crisis on the earnings quality in listed firms in advanced countries according to the level of investor protection. They used several approaches to measure the earnings quality: accruals quality, conservatism, value relevance, persistence, predictability, loss avoidance, and smoothness. The results also indicate a decrease in earnings quality during the financial crisis, being more evident in the countries with weaker shareholder protection. Also Rusmin et al. (2013), in the context of Asian financial crisis, provide evidence of an increase of earnings management which suggest that managers opportunistically smooth income to beat earnings targets in Asian transport firms.

However, on the other hand, prior literature also indicates a possible increase in the quality of financial reporting during financial crisis periods. For instance, Arthur et al. (2015) investigated earnings quality of listed firms in 14 European countries from 2005 to 2010. They found that earnings quality was higher during financial crisis period (2008-2010), suggesting that financial crisis motivates managers to enhance earnings quality in an attempt to boost investor confidence³ and reduce the negative impact of the economic downturn. Similarly, Cimini (2015) examined how 2008 financial crisis affected misrepresentation of financial information due to earnings management. The analysis is focused on listed firms from 15 European countries. The results suggest a decrease of earnings management during financial crisis, possibly due to the requirement of high-

³ During a financial crisis, the investor confidence is lower causing market illiquidity. In attempt to restore investor confidence, firms are encouraged to provide reliable financial statements, reducing information asymmetry and improving market liquidity (Arthur et al., 2015).

quality financial reporting to attract potential investors and the high audit quality required during this period.

Filip and Raffournier (2014) also documented a significant decrease in earnings smoothing and an enhancement of accruals quality during the crisis period which means a decrease in earnings management in European-listed firms. They justify this decrease with the lower incentives that managers may have in crisis periods due to a greater market tolerance for poor performance, the increased litigation risk during these periods which deter insiders to manage earnings; and due the greater demand for more timely earnings in these periods.

Likewise, Kousenidis et al. (2013) analysed the impact of recent crisis in the EU on earnings quality of listed firms in countries with weak fiscal sustainability (Greece, Ireland, Italy, Portugal and Spain). Value relevance, conditional conservatism, smoothness, earnings management, persistence, timeliness and predictability were analysed as attributes of the earnings quality. The results indicate a higher quality of earnings during the crisis period because firms that face liquidity problems and depend on external financing have incentives to improve earnings as a way to attract potential investors. Furthermore, and in the context of the Asian crisis, Chia et al. (2007) report that Singapore companies engage in less earnings management during the crisis period.

To sum it up, financial crisis is an uncommon event where firms have poor performance, lower and more volatile earnings and they are faced with big financial needs for liquidity which is scarcer in these periods due to lack of confidence of investors (Arthur et al., 2015). This might encourages firms to increase their earnings quality as a signal to attract potential investors and obtain external financing (Kousenidis et al., 2013). Another reason is the increasing monitoring by creditors, auditors and others stakeholders during the crisis which pressure managers to reduce the level of earnings management (Chia et al., 2007). Moreover, as during the crisis poor performances are already expected, the market is more predisposed to tolerate this worse performance, and hence reducing firm's incentives to manage earnings (Arthur et al., 2015; Filip & Raffournier, 2014). Lastly, if managers are concerned with investor confidence, they will have incentives to provide more credible and transparent financial reports, thus reducing information asymmetry and improving investor confidence (Arthur et al., 2015).

Thus, based on all these reasons documented in the previous literature regarding the impact of the crisis on earnings before and during the crisis, the first hypothesis is formulated as follows:

H1. Earnings quality is higher during the financial crisis period than during the pre-crisis period.

With regard to the post-crisis period, there are not many studies examining earnings quality in the European Union. However, there are also some studies that investigate other crisis, for instance the Asian crisis of 1997. Vichitsarawong et al. (2010) examine conservatism and timeliness of earnings under 1997 Asian financial crisis. They found that conservatism and timeliness are low during the crisis period, and are greater in the post-crisis period (even compared with the pre-crisis period) which might be possible due to the implementation of corporate governance reforms to increase transparency of financial reporting. In addition, Herrmann et al. (2008) examined conservatism between firms audited by Big 4 and non-Big 4 auditors during and following the financial crisis period in Thailand. Similarly to Vichitsarawong et al. (2010), the authors found an increase in conservatism in post-crisis period. Moreover, firms with Big 4 auditors reported more conservatively than firms with non-Big 4 auditors, particularly during the crisis period.

Similar to what happened in Asia, the European Union also introduced some measures in response to the financial crisis in order to solve it and prevent other future crises. In this sense, new rules have been implemented to regulate the financial sector and strengthen the supervisory framework in 2011, for instance, through the establishment of the three European supervisory authorities: European Banking Authority (EBA), European Insurance and Occupational Pensions Authority (EIOPA) and European Securities and Markets Authority (ESMA), contributing to a single rule book for financial regulation in Europe; as well as, the European Systemic Risk Board (ESRB) to monitor and detect potential threats to financial stability. The EU also created the European Stability Mechanism (ESM) providing financial assistance to countries in financial distress (Commission, 2014). In addition, with the onset of the financial crisis several weaknesses in corporate governance were revealed (Plan, 2012). Similarly to some Asian countries that implemented corporate governance reforms in the post-crisis, as reported in the Vichitsarawong et al. (2010) study, the European Commission also adopted an action plan

in 2012 to modernize European company law and corporate governance⁴ (Plan, 2012). This action plan aims to increase the level of transparency between companies and their shareholders, encourage and facilitate shareholders engagement and support business growth and competitiveness by simplifying the cross-border operations of European companies (Plan, 2012). Moreover, the financial crisis highlighted doubts about the credibility and reliability of the audited financial statements, so that in 2014 new rules⁵ were created to improve statutory audit quality and restore investor confidence in financial reporting⁶.

Therefore, taking into account these measures implemented in the European Union in response to the financial crisis, the second research hypothesis is as follows:

H2. Earnings quality is higher during the post-crisis period than during the crisis period.

In addition, since the framework before the crisis was not able to respond to the financial crisis and several measures have been implemented to combat and prevent future crises, the following research hypothesis is proposed:

H3. Earnings quality is higher during the post-crisis period than during the pre-crisis period.

2.3. Audit Quality and Earnings Quality

The role of auditors is important in helping investors to make informed decisions and improve the integrity of financial markets (Shahzad et al., 2018). Previous studies report that auditors, mainly Big 4 auditors, play an important role in the issuance of high quality financial reports, but some have questioned this role during the crisis.

Audit firms are responsible for providing assurance that financial statements reflect the fair and true view of the firm's business situation and to verify if they are fairly stated in

⁴ Corporate governance defines the relationships between the management, board, shareholders and other stakeholders of the firm, minimizes agency conflicts and prevents the wealth expropriation by managers (Plan, 2012; Vichitsarawong et al., 2010). Therefore, corporate governance is associated with a higher quality of financial reporting process as advocated by Jiang et al. (2008) who has found empirical evidence that when corporate governance is lower, firms are more likely to manipulate earnings and, hence, have lower earnings quality.

⁵ Directive 2014/56/EU and Regulation No 537/2014

⁶ Available in: https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/auditing-companies-financial-statements_en. The measures implemented at the audit level will be examined in the next subsection.

accordance with generally accepted accounting principles. Moreover, the process of auditing reduces information risk that the financial statements contain material misstatements or misleading information. Thus, it is expected that a better audit quality constrains opportunistic earnings managements, adding credibility to the firm's financial statements. Audit services are also requested to reduce asymmetry problems and agency conflicts that may arise as a result of potential interest conflicts between management and absentee owners. Besides owners, audit services can also be requested by others users, since financial information is an important source of support for stakeholders' decision-making (Hope et al., 2012; Lin & Hwang, 2010; Watts et al., 1983).

The most widely used definition of audit quality has been provided by DeAngelo (1981) who defines audit quality as the joint probability that an auditor will both “discover a breach in the client's accounting system, and report the breach” (Bing et al., 2014). This probability of reporting a breach is considered a measure of auditor's independence. If auditors' independence is compromised, they will be subject to litigation and disciplinary sanctions that could damage their reputation (DeAngelo, 1981). Further DeFond and Zhang (2014) define “higher audit quality as greater assurance of high financial reporting quality”.

In addition to the complex issue of defining audit quality, there is also the difficulty of how to measure it since there are a large number of the proxies to do it. Lin and Hwang (2010) using several attributes of audit quality found that Big 4 auditors, auditor tenure, and specialization have a negative relationship with earnings management, as well as auditor independence when measured by fee ratio and total fee. Moreover, DeFond and Zhang (2014) categorized audit quality measures into input-based proxies and output-based proxies. Input-based proxies refer to auditor-specific characteristics such as auditor size and industry specialization, and auditor-client contracting features such as audit fees. On the other hand, output based measures refer to material misstatements (restatements and AAERs⁷), auditor communication (going concern opinions), financial reporting quality (discretionary accruals, meet/beat earnings targets, accruals quality and conservatism) and finally perception-based measures (ERCs⁸, stock market reaction to audit-related events and market reaction, and cost of capital).

⁷ Accounting and Auditing Enforcement Releases

⁸ Earnings response coefficients

Following many other studies we use audit firm size as the proxy for audit quality differentiation, since it is argued that there is evidence that a Big 4⁹ audit firm is expected to have stronger incentives to provide higher audit quality rather than a non-Big4 (Becker et al., 1998; Choi et al., 2010; DeAngelo, 1981; DeFond et al., 2014; Lin & Hwang, 2010; Van Tendeloo & Vanstraelen, 2008). Big 4 auditors are viewed as having more competence due to their heavy expenditures on auditor training, facilities and programs which allows them to have better available resources (Khurana & Raman, 2004). They are also considered to be more independent than smaller audit firms because they have a larger portfolio of clients, then the importance of any single client is lower (DeAngelo, 1981). As they are subject to litigation and disciplinary sanctions if they compromised their independence, Big 4 auditors have more incentives to constrain earnings management and, hence, to conduct a high-quality audit, given that disciplinary sanctions damage greatly the auditor's reputation (DeAngelo, 1981; Van Tendeloo & Vanstraelen, 2008). Therefore, Big 4 auditors have more incentives to provide high quality audits in attempt to decrease litigation risk and protect their brand name reputation.

However, some studies have made different findings, such as bigger audit firms do not necessarily provide higher quality audits in comparison with smaller audit firms. Davidson et al. (2005)'s findings do not support a relationship between earnings management and the choice of a Big 5 auditor. Lawrence et al. (2011) also found that the effects of Big 4 auditors are insignificantly different from those of non-Big 4 auditors.

Despite these findings, it is widely accepted by the existing literature that Big 4 auditors, as high quality auditors, constraint more earnings management than non-Big 4. For this, we define our fourth hypothesis as:

H4. Firms with Big 4 auditors exhibit higher earnings quality compared to firms with non-Big 4 auditors.

In addition, it is important to note whether audit quality differentiation varies when macroeconomic conditions change (e.g. during the financial crisis), that is, whether better quality auditors (Big 4) continue to constrain more the earnings management practices in relation to non-Big 4 auditors.

⁹ The term "Big 4" is used throughout this study to refer to the four largest international audit firms: Deloitte Touche Tohmatsu, Ernst & Young, KPMG e PricewaterhouseCoopers.

During periods of economic turmoil as the 2008 financial crisis the role of auditors is called into question. Auditors, particularly the Big 4 auditors, are widely criticized by the public for not being able to warn the market before the crisis. Several companies, whether in the United Kingdom, the USA, Germany, Iceland, the Netherlands, France or Switzerland, have reported financial difficulties shortly after having been provided clean audit reports by Big 4 audit firms to their clients for those periods (Sikka, 2009).

A study that analyses the impact of financial crisis may have on audit quality and its consequences on earnings quality is the study of Mollik et al. (2013). They investigate the effects of audit quality on earnings management in the Australian context during the financial crisis. They found that Australian firms engaged more income-decreasing earnings management during the financial crisis, but audit quality did not have an impact in mitigating this behaviour. Other studies in the literature analyse the impact of the crisis on audit quality, but their conclusions are not consensual. For instance, Johl et al. (2003) analysed audit quality in the context of Asian crisis. They found that audit quality is differently across pre-crisis, crisis and post-crisis periods with greater constraint on earnings management evident in post-crisis. Shahzad et al. (2018) investigated whether investors perceived the audit quality to have declined during the crisis in US. They found evidence of an increase in the information content of earnings announcements during the crisis period compared to pre-crisis period. However, this result is not dependent on auditors' size or auditors' independence. Xu et al. (2013) found an increase in the tendency to issue going concern opinions during the crisis period compared with the previous period and that Big N auditors responded to the crisis earlier than non-Big N auditors. On contrary, Persakis and Iatridis (2016) found a decrease in audit quality during financial crisis compared with the pre-financial crisis period. Sikka (2009) found evidence of the collapse or bailout of many financial institutions after receiving unqualified audit opinions in crisis context, which raises suspicions that auditors are not sufficiently knowledgeable to provide independent and objective account of business affairs (Sikka, 2009).

There have been efforts in the European Union to enhance audit quality since the financial crisis. In 2014, the European Commission reform audit legislation through a Directive 2014/56/EU and Regulation No 537/2014 in attempt to improve audit quality and restore investor confidence in financial information. The European Commission noted a number of shortcomings, notably deficiencies in audit reports, investor doubts

about the reliability and credibility of the audited financial statements, the existence of familiarity between the management of a company and its auditor, and still of a high systematic risk due to the dominance of the Big 4 audit firms. Thus, this new legislation aims at enhancing transparency in financial reporting, reinforcing the independence of statutory auditors as well as their professional scepticism, making the audit market more dynamic and improving the supervision of statutory auditors (Commission, 2016).

Thus, based on significant evidence presenting an increase in audit quality in the context of financial crisis and due to the implementation of some measures to improve audit quality, we expect an increase in audit quality of both types of auditors after the crisis. However, as Big 4 auditors are already considered high quality auditors compared to non-Big 4, it is expected a further increase in the case of non-Big 4 auditors (a smaller audit quality differentiation between Big 4 and non-Big 4 auditors). Thus, we propose the following research hypothesis:

H5. Audit quality differentiation decreases after the financial crisis.

3. Research Methodology

This section presents the research design and the econometric models used to examine the joint impact of the 2008 financial crisis and audit quality on earnings quality. For our empirical tests, we need to use two regression models. First, we present the Kothari et al. (2005) model that allows us to calculate the discretionary accruals which are the residuals from the estimation of this model. Afterwards, in order to analyse the relationship between earnings quality, financial crisis and audit quality, we rely on various models, in which the dependent variable is the absolute value of discretionary accruals estimated in the first model. Moreover, the description of our variables and the expected signal of coefficients are also presented in this section.

3.1. Variables

To find evidence on the impact of financial crisis and audit quality on earnings quality, we use multivariate regression analysis based on the existing literature.

The dependent variable of the models, earnings quality (EQ), is measured as the absolute value of discretionary accruals estimated with the Kothari et al. (2005) model, as explained in the next section. We consider the absolute discretionary accruals because earnings management practices can use income-increasing or income-decreasing accruals to achieve targets, as explained by Arthur et al. (2015) and Becker et al. (1998). A higher magnitude of absolute discretionary accruals means a greater level of earnings management and therefore a lower earnings quality (Arthur et al., 2015). Then, EQ has to be analysed as an inverse measure of earnings quality.

As the impact of financial crisis and audit quality on firm's financial reporting strategy might be different for positive and negative discretionary accruals, we additionally estimate the models where the dependent variable is replaced by the positive/negative discretionary accruals ($DA^{+/-}$)¹⁰.

Our variables of interest regarding to the impact of financial crisis are CRISIS and POST. They are used to test H1, H2 and H3. The variable CRISIS takes the value one for observations between 2008 and 2012, and zero otherwise. This variable allows us to compare earnings quality between non-crisis period and the crisis-period. In its turn, the

¹⁰ These results are reported in the subsection 5.2.1.

dummy variable POST is used to compare earnings quality between the pre-crisis and post-crisis period, and it takes the value one for observations in the post-crisis period, and zero otherwise.

Another variable of interest, BIG4, used to test the hypotheses H4 and H5, takes the value one whether the firm is audited by a Big 4 auditor and zero if it is audited by a non-Big 4. Prior research reports that the level of audit quality has a significant impact on earnings management. As Big 4 auditors are more independent (DeAngelo, 1981), have more competence due to larger investments on auditor training, facilities and programs (Khurana & Raman, 2004) and have more to lose in case of compromising their independence, we expect that Big 4 auditors constrain earnings management. Therefore, we expect that firms with Big 4 auditors report higher earnings quality, that is, the coefficient on BIG4 has an expected negative signal.

There are other variables that may influence earnings quality. Thus, following other studies (Arthur et al., 2015; Van Tendeloo & Vanstraelen, 2008), we include some control variables in the model to take into account some effects of firm characteristics that are expected to be related to discretionary accruals.

Following Van Tendeloo and Vanstraelen (2008) and Arthur et al. (2015), we use the yearly sales growth rate (GROWTH) to control differences in performance, because the market penalises growth firms with unexpected adverse earnings (Arthur et al., 2015; Skinner & Sloan, 2002). Normally, growth firms are associated with greater information asymmetries, so it is expected that they will have more incentives to manage earnings (Madhogarhia et al., 2009). Therefore, we expect that high-growth firms report lower-quality earnings, in other words, we expect the signal of the coefficient of GROWTH to be positive. Accrual-based measures of earnings quality capture either the uncertainty of the business model or the discretionary choices of managers and Francis et al. (2005) provides evidences on the higher impact of business uncertainty, consistent with higher growth implying poor earnings quality.

We also include a size variable (SIZE) defined as natural logarithm of total assets. According to Arthur et al. (2015), larger firms are more monitored by the market and, then managers have less incentives to manage earnings. Therefore, the expected signal of the coefficient is negative because larger firms are negatively associated with discretionary accruals.

Prior literature argues that highly leveraged firms usually have incentives to engage in earnings management practices to avoid debt covenant violations (DeFond & Jiambalvo, 1994). Conversely, these firms are also highly controlled by debt holders, which represents a constraint to the earnings management practices, so they are expected to have more incentive to show higher financial reports quality (Arthur et al., 2015; DeFond & Jiambalvo, 1994; Watts & Zimmerman, 1990). Therefore, a leverage variable is also included (LEV), given by the ratio of total liabilities to total assets, and its signal is not predictable.

Finally, industry and country dummy variables were also included as industry and country-fixed effects to control for industry and country differences. Industries are classified according to ICB (Industry Classification Benchmark).

All variable definitions are presented below in Table 1.

Table 1 - Variable Description

Variable	Definition
EQ	Earnings quality. Absolute value of discretionary accruals. Discretionary accruals are the residuals from the Kothari et al. (2005) model estimation.
DA ^{+/-}	Positive/negative discretionary accruals from the Kothari et al. (2005) model estimation.
POST	Dummy variable; takes the value 1 for observations in the post-crisis period (2013-2016) and 0 otherwise.
CRISIS	Dummy variable; takes the value 1 for observations in the crisis period (2008-2012) and 0 otherwise.
BIG4	Dummy variable; takes the value 1 if the auditor is a Big Four (Deloitte Touche Tohmatsu, PriceWaterHouseCooper, Ernst & Young, KPMG) and 0 otherwise.
GROWTH	Yearly sales growth rate.
SIZE	Natural of logarithm of total assets.
LEV	Leverage; Total liabilities divided by total assets.
Country	Vector of country dummy variables
Industry	Vector of industry dummy variables

3.2. Empirical Models

As previously mentioned, discretionary accruals are used as an earnings management measure as they capture the management discretion. Therefore, we use the following regression model of Kothari et al. (2005), which is based on the modified version of Jones model with control for firm performance, to calculate discretionary accruals:

$$TA_{i,t} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{i,t-1}} \right) + \alpha_2 (\Delta REV_{i,t} - \Delta REC_{i,t}) + \alpha_3 PPE_{i,t} + \alpha_4 ROA_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where:

$TA_{i,t}$ - total accruals scaled by lagged total assets for firm i in year t ;

$A_{i,t-1}$ - lagged total assets for firm i in year $t-1$;

$\Delta REV_{i,t}$ - change in revenues (sales) scaled by lagged total assets for firm i ;

$\Delta REC_{i,t}$ - change in accounts receivables scaled by lagged total assets for firm i ;

$PPE_{i,t}$ - net property, plant, and equipment scaled by lagged total assets for firm i ;

$ROA_{i,t}$ - return on assets for firm i in year t ;

$\varepsilon_{i,t}$ - error term.

Kothari et al. (2005) argue that discretionary accruals models from Jones (1991) and Dechow et al. (1995) are subject to measurement errors when applied to samples of firms with extreme performance, in part because discretionary accruals are correlated with growth in operating performance. Therefore, Kothari et al. (2005) introduced the variable ROA to the modified version of Jones model to control the performance effect on unexpected accruals. The assets as the deflator and the intercept are introduced in the model to control for heteroscedasticity in residuals (Kothari et al., 2005).

The dependent variable of the model is TA (total accruals), calculated as Δ non-cash current assets – (Δ current liabilities - Δ current portion of long-term debt) - depreciation and amortization, scaled by lagged total assets (Kothari et al., 2005).

Therefore, discretionary accruals are defined as the residuals from annual cross-sectional regressions estimated at the industry level, by using the Industry Classification Benchmark (ICB), with panel data structure and using the OLS (ordinary least squares method). Then, their absolute value will be used as the earnings quality measure in the next models (2, 3 and 4), which allow us examine our research hypothesis.

Regarding the impact of financial crisis and audit quality on earnings quality, we use three models (2, 3 and 4) that are estimated using a panel data structure and the OLS estimation method in EViews10 software. In order to control for heterogeneity across industries and countries, we use dummy variables for countries and industries. We do not use time fixed effects because we aim at detecting differences between years classified as pre-crisis, crisis and post-crisis. All variables are defined in Panel A of Table 1.

Regression model (2) is used to test H1 and H2 since it allows us to compare earnings quality between the period of non-crisis (before and after the crisis) and the crisis period, due to the inclusion of the CRISIS variable. For this purpose, this model is run separately during all period of analysis (2006-2016), the pre-crisis and crisis period (2006-2012) and the crisis and post-crisis period (2008-2016). The dummy variable CRISIS is used to examine the difference in earnings quality between each sub period.

$$EQ_{i,t} = \alpha_0 + \alpha_1 CRISIS_{i,t} + \alpha_2 BIG4_{i,t} + \alpha_3 GROWTH_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 LEV_{i,t} + \sum Country + \sum Industry + \varepsilon_{i,t} \quad (2)$$

To test H3, the regression model (3) is used since it includes the POST variable that allows analysing the differences in earnings quality between the pre and post-crisis period.

$$EQ_{i,t} = \alpha_0 + \alpha_1 POST_{i,t} + \alpha_2 BIG4_{i,t} + \alpha_3 GROWTH_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 LEV_{i,t} + \sum Country + \sum Industry + \varepsilon_{i,t} \quad (3)$$

Both models (2) and (3) also allow us to analyse H4 through the variable BIG4.

The dependent variable (EQ) is measured as the absolute value of discretionary accruals estimated from the residuals obtained from the Kothari et al. (2005) model. The independent and control variables are chosen from the previous literature that argue that they have a significant impact on earnings quality.

In addition, in order to test H5, we use regression model (4), without dummies for crisis and post-crisis periods. This model is estimated for the three different subperiods (pre-crisis, crisis and post-crisis) to analyse whether the role of Big 4 auditors in restricting earnings management over these three subperiods undergoes some change.

$$EQ_{i,t} = \alpha_0 + \alpha_1 CRISIS_{i,t} + \alpha_2 BIG4_{i,t} + \alpha_3 GROWTH_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 LEV_{i,t} + \sum Country + \sum Industry + \varepsilon_{i,t} \quad (4)$$

4. Sample and Descriptive Statistics

4.1. Sample

For the purpose of this study, all data is collected from Thomson DataStream database. The initial sample consists of all listed firms in 15 European countries¹¹, over the period from 2005 to 2016¹². Luxembourg is excluded from the sample because of the insufficient number of observations. Taking into account that in our model some variables require lagged values, we begin collecting data from 2005, which allows us to analyse the period from 2006 to 2016. Hence, after applying these initial restrictions we get an initial sample composed by 6049 firms.

Consistent with previous studies (Arthur et al., 2015; Burgstahler et al., 2006; Coppins & Peek, 2005; Persakis & Iatridis, 2015; Van Tendeloo & Vanstraelen, 2008), and in order to increase the comparability between countries, we exclude financial institutions such as financial services, banks, insurance and real estate firms and other financial institutions because of their specific nature and their different accounting requirements. Further, firms with no information about auditor name are also excluded. Finally, firms that do not have at least six years of full data are also discarded from our sample. Therefore, the final sample includes 2132 firms.

Table 2 - Sample Construction

Initial Sample	6049
Banks, financial services, insurance and real estate firms, other financial institutions and firms	(1363)
Firms without auditor data	(852)
Firms without at least six years of full data	(1702)
Final Sample	2132

According to previous studies (Cimini, 2015; Persakis & Iatridis, 2015; Persakis & Iatridis, 2016), we consider the years 2008-2012 to define the crisis period. Thus, the sample is categorized into three subperiods: pre-crisis (2005-2007), crisis (2008-2012), and post-crisis period (2013-2016).

¹¹ Countries that belonged to the EU at the time of all listed firms started to adopt IFRs: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

¹² The sample period starts in 2005 because it was when EU began to prepare their financial statements according to IFRSs (Regulation 1606/2002) and, ends in 2016 because it is the last year with available information in the database at the moment of data collection.

Finally, to mitigate potential outlier problems, all our variables (except for the dummy variables) are winsorized at the 1st and 99th percentiles.

4.2. Descriptive Statistics

Table 3 and Table 4 report the sample composition by country, industry and auditor type. As illustrated in Table 3, the sample is mainly composed by firms from the United Kingdom (36.77%), Germany (18.53%) and France (12.90%). These three countries represent more than half of the firms in the sample, with approximately 68.20%. In turns, the least significant countries of the samples are Ireland (1.22%), followed by Portugal (1.27%) and Austria (1.36%), making up only 3.85% of the total firms in the sample. In terms of auditor type, all Finnish companies are audited by a Big 4 auditor, Sweden is the second country with the highest percentage of companies audited by a Big 4 (97.66%), followed by the Netherlands (96.36%). Greece has more than half of its firms audited by a non-Big 4 auditor (58.70%) and in the United Kingdom that percentage reaches 39.03%.

Table 3 - Sample Composition by Country and Auditor

Country code	Country	Frequency	% (total)	Big4	% (country)	Non-Big4	% (country)
AT	Austria	29	1.36%	22	75.86%	7	24.14%
BE	Belgium	52	2.44%	44	84.62%	8	15.38%
DE	Germany	395	18.53%	325	82.28%	70	17.72%
DK	Denmark	58	2.72%	55	94.83%	3	5.17%
ES	Spain	64	3.00%	60	93.75%	4	6.25%
FI	Finland	72	3.38%	72	100.00%	0	0.00%
FR	France	275	12.90%	217	78.91%	58	21.09%
GB	United Kingdom	784	36.77%	478	60.97%	306	39.03%
GR	Greece	46	2.16%	19	41.30%	27	58.70%
IE	Ireland	26	1.22%	24	92.31%	2	7.69%
IT	Italy	121	5.68%	112	92.56%	9	7.44%
NL	Netherland	55	2.58%	53	96.36%	2	3.64%
PT	Portugal	27	1.27%	25	92.59%	2	7.41%
SE	Sweden	128	6.00%	125	97.66%	3	2.34%

Table 4 provides the firm's distribution by industry using the ICB (Industry Classification Benchmark). The industries with more weight in the sample are Industrials, Consumer Services and Consumer Goods, representing 29.22%, 15.81% and 13.79%, respectively. The smaller industries are Telecommunications, Utilities and Oil & Gas, with approximately 1.64%, 2.72% and 6.10%, respectively.

Table 4 - Sample Composition by Industry and Auditor

Industry	Denomination	Frequency	% (total)	Big4	% (industry)	Non-Big4	% (industry)
1	Oil & Gas	130	6.10%	91	70.00%	39	30.00%
2	Basic Materials	217	10.18%	136	62.67%	81	37.33%
3	Industrials	623	29.22%	498	79.94%	125	20.06%
4	Consumer Goods	294	13.79%	232	78.91%	62	21.09%
5	Health Care	190	8.91%	156	82.11%	34	17.89%
6	Consumer Services	337	15.81%	268	79.53%	69	20.47%
7	Telecommunications	35	1.64%	31	88.57%	4	11.43%
8	Utilities	58	2.72%	51	87.93%	7	12.07%
9	Technology	248	11.63%	168	67.74%	80	32.26%

As regards auditor type, the telecommunications industry is the one that has a larger percentage of its firms audited by a Big4 auditor (88.57%), followed closely by the utilities industry (87.93%). Furthermore, the industry with the highest percentage of firms audited by non-Big 4 auditors is the basic materials industry (37.33%), followed by the technology industry (32.26%).

5. Empirical Results

In this chapter the empirical results are presented and discussed. Firstly, we compute and analyse some descriptive statistics and then we proceed with the Pearson correlation analysis. In the next section we report the results and the regression estimations, as well as, additional and robustness tests.

5.1. Univariate Results

Table 5 display descriptive statistics of the main variables used in our analysis. Panel A indicates several descriptive statistics – the means, medians, maximum and minimum values, standard deviation and number of observations - for the full sample. Panel B and C show the mean values of earnings quality (EQ), positive and negative discretionary accruals ($DA^{+/-}$) for the pre-crisis (2006-2007), crisis (2008-2012) and post-crisis periods (2013-2016) and for each auditor type (Big 4 or non-Big 4), respectively.

As illustrated in Table 5 Panel A, earnings quality reveals a mean of 0.061 which suggest that firms may engage in earnings management practices. This finding is consistent with Arthur et al. (2015) who found that the mean value of absolute discretionary accruals is about 0.065 for a sample similar to ours, but for a different sampling period. Moreover, it is also shown that firms that engage in income-decreasing earnings management practices, on average, use more discretionary accruals (-0.063) than firms that engage in income-increasing earnings management (0.059). However, there are more firm-years observations in our sample with positive discretionary accruals (9533) than with negative discretionary accruals (8923). Regarding to audit quality, a large percentage of firms (76.5%) are audit by Big 4 audit firms as opposed to only 23.5% of firms which are audit by a non-Big4 audit firms. In relation to control variables, the firms' size, measured by the natural logarithm of total assets has a mean value 12.634. Firms in our sample exhibit a leverage ratio of 52.5%, measured by total liabilities/total assets. This means a ratio between equity and total assets of 47.5%, consistent with a significant financing with capital equity. Firms also reveal an average annual sales growth rate of 11.4%. Panel B of Table 5 demonstrates that with the impact of the crisis, the mean value of earnings quality decreases from 0.070 (in pre-crisis period) to 0.062 (during the crisis period) and then to 0.056 (after the crisis period), which validates the first three research hypotheses. This result means that during the crisis period earnings quality is higher representing a decrease in earnings management practices which

also occurs in the period following the crisis. Moreover, it is also observed that, on average, firms that engage in income-increasing earnings management practices show a greater decrease in earnings management over the three periods than firms with income-decreasing earnings management. Concerning how audit quality affect earnings quality, the results in Panel C appear that, on average, a firm audited by a Big 4 have better earnings quality than companies audited by non-Big4, which is consistent with H4.

Table 5 - Descriptive Statistics

Panel A: Descriptive statistics for full sample						
	Mean	Median	Minimum	Maximum	Std. Dev.	Observations
EQ	0.061	0.037	0	0.582	0.073	18456
DA ⁺	0.059	0.036	0	0.582	0.070	9533
DA ⁻	-0.063	-0.038	-0.551	0	0.076	8923
BIG4	0.765	1	0	1	0.424	25584
GROWTH	0.114	0.052	-0.833	3.076	0.452	21434
SIZE	12.634	12.508	7.031	18.375	2.426	24508
LEV	0.525	0.531	0.019	1.533	0.253	24503

Panel B: Mean values for EQ, DA ⁺ and DA ⁻ by period			
	Pre-crisis (2006-2007)	Crisis (2008-2012)	Post-Crisis (2013-2016)
EQ	0.070	0.062	0.056
DA ⁺	0.070	0.061	0.053
DA ⁻	-0.072	-0.065	-0.059

Panel C: Mean values for EQ, DA ⁺ and DA ⁻ by auditor type		
	Big 4	Non-Big 4
EQ	0,055	0,083
DA ⁺	0,053	0,077
DA ⁻	-0,056	-0,090

Notes: This table summarizes the descriptive statistics for the main variables. Panel A reports the mean, median, minimum and maximum values, standard deviation, as well as the total numbers of observations for the analysis period 2006-2016. Panel B shows the mean values of EQ, DA⁺ and DA⁻ for each sub period. Panel C shows the mean values of EQ, DA⁺ and DA⁻ for each auditor type. All variables are defined in Table 1.

In addition, it would be interesting to analyse the level of earnings quality by country. Table 6 displays the mean values of our dependent variables (EQ, DA⁺ and DA⁻) for each country. In general, it is verified that Austria is the country with the highest earnings quality (the lowest value of discretionary accruals), followed by Ireland. At the opposite extreme, we have the United Kingdom, followed by Greece as the countries with the lowest

earnings quality. As regards the United Kingdom, one might think that being the United Kingdom classified as common-law and with a well-developed financial market, this would lead to a better quality of financial information. However, the measures of earnings quality are also affected by managers' incentives, in particular because their remuneration may depend on reported results.

Table 6 – Descriptive Statistics by Country

Country code	Country	EQ	DA ⁺	DA ⁻
AT	Austria	0.044	0.044	-0.045
BE	Belgium	0.056	0.054	-0.058
DE	Germany	0.059	0.057	-0.060
DK	Denmark	0.060	0.054	-0.066
ES	Spain	0.055	0.052	-0.059
FI	Finland	0.054	0.052	-0.055
FR	France	0.050	0.047	-0.052
GB	United Kingdom	0.071	0.068	-0.075
GR	Greece	0.065	0.062	-0.069
IE	Ireland	0.047	0.047	-0.046
IT	Italy	0.055	0.054	-0.055
NL	Netherland	0.051	0.051	-0.050
PT	Portugal	0.057	0.054	-0.061
SE	Sweden	0.057	0.057	-0.057

Notes: This table provides the mean values of EQ, DA⁺ and DA⁻ for each country. The variables are defined in Table 1.

Table 7 reports the Pearson correlation coefficients between the main variables. We find a negative and statistically significant correlation between the audit quality proxy and earnings quality, which is consistent with previous literature that high-quality auditors are encouraged to constrain earnings management practices. We also find statistically significant correlations between the earnings quality measure and firm's growth (positive), firm's size (negative) and leverage ratio (positive).

The correlation coefficients between the explanatory variables are generally weak which suggests the non-existence of a multicollinearity problem.

Table 7 - Pearson Correlation Matrix

	EQ	BIG4	GROWTH	SIZE	LEV
EQ	1				
BIG4	-0.160***	1			
GROWTH	0.129***	-0.055***	1		
SIZE	-0.286***	0.466***	-0.104***	1	
LEV	0.059***	0.152***	-0.108***	0.258***	1

Notes: *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. The table reports the Pearson correlation coefficients. All variables are defined in Table 1.

5.2. Multivariate Results

One of the objectives of this study is to analyse how earnings quality varies with the impact of financial crisis. In order to analyse this variation in more detail over the three subperiods, we run regression model (2) during: a) the whole period of analysis, where the dummy variable crisis allows analysing the difference in earnings quality between the non-crisis and crisis period; b) the pre-crisis and crisis period, to understand how earnings quality has changed from a period with normal economic conditions to a period of financial depression; and c) during the crisis and post-crisis period. Therefore, a higher value of EQ should be interpreted as having a higher level of earnings management and, hence, a lower earnings quality (Arthur et al., 2015).

Table 8 reports the OLS results of the panel data regression model (2). The results for the non-crisis and crisis period are presented in Column 1, the pre-crisis and crisis period in Column 2, and the crisis and post-crisis period in Column 3.

Analysing the first column of Table 8, it can be seen that there is no statistically significant impact of the financial crisis on the earnings quality. A plausible explanation is that the non-crisis period includes two distinct periods (pre and post-crisis periods) and then is not possible to say whether earnings quality is better or worse during a period of financial depression. Therefore, Columns (2) and (3) show the differences in earnings quality between the crisis period and the other periods separately. This may help to understand why earnings quality cannot be differentiated for crisis and non-crisis periods. Column (2) indicates that CRISIS coefficient is negative and statistically significant at 1% ($\alpha_1 = -0.007$). This result indicates a decrease in the absolute value of discretionary accruals (earnings quality improvement) during a period of economic recession comparing with the pre-crisis period, and therefore these findings provide support for the research hypothesis

H1. This result is similar to that obtained in Arthur et al. (2015). Column (3) of Table 8 reports a positive and statistically significant (at 1%) coefficient for CRISIS ($\alpha_1=0.004$) which means that the absolute value of discretionary accruals is higher (earnings quality is lower) in the crisis period than during the post-crisis period. This implies that from the crisis period to the period following the crisis, earnings management has decreased and, hence, earnings quality has improved. This result validates the hypothesis H2, which supports the notion that the increase in earnings quality after the crisis period may be due to the implementation of some measures by the EU in response to the financial crisis to solve it and prevent possible crises.

Table 8 - Regression Results: The Impact of Financial Crisis on Earnings Quality

$EQ_{it} = \alpha_0 + \alpha_1 CRISIS_{it} + \alpha_2 BIG4_{it} + \alpha_3 GROWTH_{it} + \alpha_4 SIZE_{it} + \alpha_5 LEV_{it} + \sum Country_{it} + \sum Industry_{it} + \epsilon_{it}$ (2)			
Variables	(1) 2006-2016	(2) 2006-2012	(3) 2008-2016
C	0.158 (27.430)	0.164 (21.093)	0.158 (26.335)
CRISIS	0.001 (1.022)	-0.007*** (-4.164)	0.004*** (3.464)
BIG4	-0.005*** (-3.554)	-0.007*** (-3.643)	-0.005*** (-3.058)
GROWTH	0.017*** (14.927)	0.016*** (10.780)	0.015*** (11.926)
SIZE	-0.009*** (-32.918)	-0.008*** (-23.158)	-0.009*** (-31.942)
LEV	0.053*** (23.402)	0.052*** (16.137)	0.055*** (23.152)
Country Dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
N	17758	10611	15342
R ²	0.122	0.110	0.128
Adj. R ²	0.121	0.107	0.126
F-statistic	95.169***	50.057***	86.139***

Notes: *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively and the t-statistics may be found in the parentheses. The table shows the OLS results of the panel data regression model (2). All variables are defined in Table 1. Column (1) presents the regression results for the whole period of analysis (2006-2016), Column (2) for the pre-crisis and crisis period (2006-2012) and Column (3) for the crisis and post-crisis period (2008-2016).

In addition, the results for regression (3) with a post-crisis dummy variable to analyse the impact of financial crisis on earnings quality between the pre-crisis period (2006-2007) and post-crisis period (2013-2016) are present in Table 9. The dummy variable POST takes the value of 1 if the sample is in the post-crisis period and 0 otherwise. According to H3, we expect a negative signal for the coefficient α_1 , which means a lower value of earnings

management during the post-crisis period compared to pre-crisis period. We find that the coefficient of dummy variable POST is negatively and statistically significant at 1% ($\alpha_1 = -0.010$). This means a decrease in the use of discretionary accruals, which indicates a decrease in the level of earnings management and, consequently, an increase in earnings quality in the post-crisis period than in the pre-crisis period. This result validates H3, suggesting that the measures that have been implemented have taken effect.

Table 9 - Regression Results: Earnings Quality Before and After the Financial Crisis

$EQ_{i,t} = \alpha_0 + \alpha_1 POST_{i,t} + \alpha_2 BIG4_{i,t} + \alpha_3 GROWTH_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 LEV_{i,t} + \Sigma Country_{i,t} + \Sigma Industry_{i,t} + \epsilon_{it} \quad (3)$		
Variables	EQ	T-Stat
C	0.161	(20.333)
POST	-0.010***	(-6.171)
BIG4	-0.004**	(-2.088)
GROWTH	0.019***	(12.093)
SIZE	-0.009***	(-24.455)
LEV	0.052***	(17.288)
Country Dummies	Yes	
Industry Dummies	Yes	
N	9563	
R ²	0.140	
Adj. R ²	0.138	
F-statistic	59.873***	

Notes: *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively, and the t-statistics may be found in the last column. The table shows the OLS results of the estimation of panel data regression (3) for the pre-crisis (2006-2007) and post-crisis period (2012-2016). All variables are defined in the Table 1.

To summarize, we find that the earnings quality tends to be higher in the crisis period than in the previous period and it is even higher in the post-crisis period relative to the crisis period. That is, earnings quality is better in post-crisis period than in the pre-crisis period.

With regard to audit quality, tables 8 and 9 show a coefficient for the BIG4 variable negative and statistically significant, which supports H4 that firms audited by a Big 4 auditor engage less in earnings management in relation to firms audited by a non-Big 4 auditor. This means that firms audited by a Big 4 present better quality financial reports. This result is in line with the findings presented by Arthur et al. (2015) and Van Tendeloo and Vanstraelen (2008).

Finally, to test H5, the regression model (4) is estimated for each sub period. The results are reported in Table 10. The coefficient α_1 is interpreted as the differentiated effect of Big 4 auditors on earnings quality. It is possible to see that Big 4 auditors during the pre-crisis period (Column 1) contribute to a greater constraint of earnings management ($\alpha_1 = -0.010$) in relation to non-Big 4 auditors. The impact of this audit quality differentiation decreases ($\alpha_1 = -0.006$) during the crisis period (Column 2) and after the crisis (Column 3) there is no significant difference in quality provided by Big 4 and non-Big 4 auditors. This result supports the hypothesis that audit quality differentiation decreases after the financial crisis and suggests that non-Big 4 auditors develop more competent auditing practices after the financial crisis, probably because of the efforts made to improve audit quality in EU since the financial crisis.

Table 10 – The Effect of Audit Quality on Earnings Quality During the Financial Crisis

$EQ_{i,t} = \alpha_0 + \alpha_1 \text{BIG4} + \alpha_2 \text{GROWTH}_{i,t} + \alpha_3 \text{SIZE}_{i,t} + \alpha_4 \text{LEV}_{i,t} + \Sigma \text{Country}_{i,t} + \Sigma \text{Industry}_{i,t} + \varepsilon_{it}$ (4)			
Variables	(1) 2006-2007	(2) 2008-2012	(3) 2013-2016
C	0.138 (7.626)	0.164 (19.631)	0.157 (18.443)
BIG4	-0.010** (-2.182)	-0.006*** (-3.014)	-0.002 (-1.138)
GROWTH	0.023*** (7.384)	0.013*** (7.856)	0.017*** (9.079)
SIZE	-0.007*** (-8.412)	-0.008*** (-21.842)	-0.009*** (-23.643)
LEV	0.042*** (5.374)	0.054*** (15.619)	0.055*** (17.285)
Country Dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
N	2416	8195	7147
R ²	0.113	0.112	0.152
Adj. R ²	0.103	0.110	0.149
F-statistic	12.144***	41.416***	50.874***

Notes: *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively and the t-statistics may be found in the parentheses. The table shows the OLS results of the panel data regression model (4). All variables are defined in the Table 1. Column (1) presents the regression results for the pre-crisis period, Column (2) for the crisis period and Column (3) for the post-crisis period.

Examining control variables, tables 8 to 10 indicate that the variable GROWTH, that aims to control the effect of the firm performance on earnings quality, has positive and statistically significant coefficients. This result is consistent with the results obtained by Arthur et al. (2015). Looking to firm size variable (SIZE), we find a negative and statistically significant coefficient as expected, meaning that larger firms present lower levels of discretionary accruals than smaller firms and hence a higher earnings quality. This

finding agree with the study of (Arthur et al., 2015), suggesting that market control, which is more significant in larger firms, represents an incentive to reduce the earnings management. Regarding the variable LEV, it is possible to verify that there is a positive relationship between leverage and the magnitude of the absolute discretionary accruals. That is, we conclude that high leverage firms experience a lower quality financial reporting, which is in line with some studies (DeFond & Jiambalvo, 1994), that argue that highly leveraged firms usually try to engage in earnings management practices to avoid debt covenant violations.

Moreover, it can be observed a statistically significant F-statistic at 1% in table 8, 9 and 10. This means that the independent variables jointly affect dependent variable (EQ) at 1% significance level, so the regression models have predictive capability. Additionally, the adjusted R^2 for the regression models are low (from 0.103 to 0.149), which means that the independent variables only explain from 10.3% to 14.9% of variation of absolute value of discretionary accruals, respectively. However, these values are in line with those found by Arthur et al. (2015).

5.2.1. Robustness Tests

To evaluate the robustness of our results, we split our sample into two subsamples based on the sign of firms' discretionary accruals (positive or negative), to ascertain whether there is a different effect of income-increasing or decreasing earnings management (Arthur et al., 2015; Filip & Raffournier, 2014). In this regard, we estimate regression models where the dependent variable is replaced by the positive or the negative discretionary accruals. This procedure despite being followed by many researchers should be analysed with caution because if abnormal accruals are inflated over one period they will revert in the following period. The regression results are reported in Tables 11 to 13.

Table 11 reports the OLS results of the panel data regression model (2) for both positive and negative discretionary accruals. Column 1 displays the results for the non-crisis and crisis period, Column 2 for the pre-crisis and crisis period, and Column 3 for the crisis and post-crisis period. It can be seen that the financial crisis has no statistically significant impact (Column 1) on both positive and negative discretionary accruals as previously noted. However, when analysing the impact of the financial crisis compared to the period before it (Column 2), the results show a statistically significant reduction of (both positive and negative) discretionary accruals during the crisis period. This result is also consistent

with H1. In relation to the crisis period when compared to the post-crisis period (Column 3), firms use more discretionary accruals in the crisis period compared to the post-crisis period. This is in line with H2 that earnings quality is higher in the post-crisis period than during the financial crisis.

Table 11 - Regression Results: The Impact of Financial Crisis on Positive and Negative Discretionary Accruals

$DA^{+/-}_{i,t} = \alpha_0 + \alpha_1 CRISIS_{i,t} + \alpha_2 BIG4_{i,t} + \alpha_3 GROWTH_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 LEV_{i,t} + \Sigma Country_{i,t} + \Sigma Industry_{i,t} + \varepsilon_{it}$ (2)						
	(1) 2006-2016		(2) 2006-2012		(3) 2008-2016	
Variables	DA ⁺	DA ⁻	DA ⁺	DA ⁻	DA ⁺	DA ⁻
C	0.148 (18.461)	-0.166 (-20.053)	0.152 (14.466)	-0.180 (-15.084)	0.150 (17.475)	-0.165 (-19.380)
CRISIS	0.001 (0.687)	-0.002 (-1.082)	-0.007*** (-3.484)	0.006** (2.551)	0.004*** (2.807)	-0.004** (-2.537)
BIG4	-0.003* (-1.743)	0.004*** (3.542)	-0.002 (-0.721)	0.014*** (4.639)	-0.004* (-1.852)	0.006*** (2.762)
GROWTH	0.018*** (12.155)	-0.016*** (-9.064)	0.017*** (8.829)	-0.015*** (-6.396)	0.016*** (10.195)	-0.013*** (-6.750)
SIZE	-0.008*** (-22.534)	0.009*** (23.331)	-0.008*** (-16.197)	0.008*** (16.104)	-0.008*** (-21.303)	0.009*** (23.065)
LEV	0.042*** (13.018)	-0.062*** (-18.975)	0.042*** (9.557)	-0.059*** (-12.445)	0.042*** (12.664)	-0.064*** (-18.900)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	9074	8684	5580	5031	7764	7578
R ²	0.109	0.140	0.097	0.130	0.111	0.148
Adj. R ²	0.106	0.137	0.092	0.126	0.108	0.145
F-statistic	42.471***	54.205***	22.847***	28.785***	37.250***	50.283***

Notes: *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively and the t-statistics may be found in the parentheses. The table shows the OLS results of the panel data regression model (2), where the dependent variable is replaced by the positive and negative discretionary accruals. All variables are defined in the Table 1. Column (1) presents the regression results for the whole period of analysis (2006-2016), Column (2) for the pre-crisis and crisis period (2006-2012) and Column (3) for the crisis and post-crisis period (2008-2016).

The OLS results of the panel data regression model (3) are present in Table 12, where Column 1 presents it for the subsample with firms with positive discretionary accruals and Column 2 for the subsample with firms with negative discretionary accruals. The results confirm the previous findings that firms engage in less positive and negative earnings management in the period after the financial crisis, supporting H3.

Table 12 - Regression Results: Positive and Negative Discretionary Accruals Before and After the Financial Crisis

$DA^{+/-}_{it} = \alpha_0 + \alpha_1 POST_{it} + \alpha_2 BIG4_{it} + \alpha_3 GROWTH_{it} + \alpha_4 SIZE_{it} + \alpha_5 LEV_{it} + \Sigma Country_{it} + \Sigma Industry_{it} + \varepsilon_{it}$ (3)				
Variables	(1) DA ⁺	T-Stat	(2) DA ⁻	T-Stat
C	0.153	(13.809)	-0.166	(-14.743)
POST	-0.011***	(-5.110)	0.010***	(4.099)
BIG4	-0.005*	(-1.781)	0.004	(1.361)
GROWTH	0.019***	(9.207)	-0.019***	(-7.934)
SIZE	-0.008***	(-17.061)	0.009***	(17.203)
LEV	0.038***	(8.944)	-0.063***	(-14.627)
Country Dummies	Yes		Yes	
Industry Dummies	Yes		Yes	
N	4 804		4 759	
R ²	0.135		0.152	
Adj. R ²	0.131		0.148	
F-statistic	28.777***		32.727***	

Notes: *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively, and the t-statistics may be found in the last column. The table shows the OLS results if the panel data regression model (3) for the pre-crisis (2006-2007) and post-crisis period (2012-2016). The dependent variables are replaced by positive discretionary accruals (Column 1) and negative discretionary accruals (Column 2). All variables are defined in the Table 1.

The results for OLS estimation of model (4), with Da^+ e Da^- as dependent variables, are present in Table 13. It is possible to see that during the pre-crisis period (Column 1) and during the crisis period (Column 2), Big 4 auditors contribute to a greater constraint of income-decreasing earnings management in comparison with non-Big 4, but there is no evidence of such audit quality differentiation when auditors are faced with income-increasing discretionary accruals. The result for after the crisis (Column 3) indicates that Big 4 auditors tend to constrain more income-increasing discretionary accruals than non-Big 4, however this result does not occur for income-decreasing earnings management. This leads us to accept the hypothesis H5 that audit quality differentiation decreases after the financial crisis, but only in case of income-decreasing earnings management and to reject the same hypothesis in case of income-increasing earnings management.

Table 13 - The Effect of Audit Quality on Positive and Negative Discretionary Accruals During the Financial Crisis

$Da^+/Da_{i,t}^- = \alpha_0 + \alpha_1 BIG4 + \alpha_2 GROWTH_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 LEV_{i,t} + \Sigma Country_{i,t} + \Sigma Industry_{i,t} + \epsilon_{it}$ (4)						
	(1) 2006-2007		(2) 2008-2012		(3) 2013-2016	
Variables	Da ⁺	Da ⁻	Da ⁺	Da ⁻	Da ⁺	Da ⁻
C	0.125 (5.492)	-0.170 (-5.804)	0.153 (13.215)	-0.177 (-14.531)	0.153 (12.258)	-0.158 (-13.498)
BIG4	-0.002 (-0.388)	0.022*** (3.085)	-0.002 (-0.635)	0.012*** (3.831)	-0.006* (-1.945)	-0.001 (-0.157)
GROWTH	0.020*** (5.161)	-0.027*** (-5.471)	0.015*** (7.046)	-0.010*** (-3.980)	0.018*** (7.401)	-0.015*** (-5.447)
SIZE	-0.007*** (-6.706)	0.007*** (5.117)	-0.008*** (-14.750)	0.009*** (15.592)	-0.009*** (-16.012)	0.010*** (17.100)
LEV	0.031*** (3.132)	-0.052*** (-4.254)	0.045*** (9.239)	-0.061*** (-12.032)	0.040*** (8.730)	-0.066*** (-14.749)
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	1310	1106	4270	3925	3494	3653
R ²	0.115	0.144	0.094	0.137	0.145	0.167
Adj. R ²	0.098	0.124	0.089	0.132	0.139	0.162
F-statistic	6.683***	7.268***	17.620***	24.810***	23.489***	29.163***

Notes: *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively and the t-statistics may be found in the parentheses. The table shows the OLS results of the panel data regression model (4), where the dependent variable is replaced by the positive and negative discretionary accruals. All variables are defined in the table 1. Column (1) presents the regression results for the pre-crisis, Column (2) for the crisis and Column (3) for the post-crisis period.

As a further robustness check, we exclude the United Kingdom from the sample to verify whether the results remain robust in the other thirteen countries since the findings may be influenced by the most representative country of the sample (the United Kingdom). For the sake of brevity, the results are not presented. The robustness test provides support for the hypotheses concerning the impact of the financial crisis on earnings quality. However, the results about the impact of audit quality on earnings quality are controversial. There is no significant evidence of differential audit quality between the Big 4 and non-Big 4 auditors in the pre-crisis and crisis periods; however, in the post-crisis period Big 4 auditors constrain less earnings management than non-Big 4.

As a final robustness test, we estimate the models separately for the United Kingdom. The results (not reported) confirm an improvement in earnings quality from pre-crisis to post-crisis period. However, there is no statistically significant difference in earnings quality between the crisis and post-crisis period. Concerning the audit quality,

firms audited by a Big 4 have better earnings quality than firms audited by a non-Big 4 after the crisis. However, before and during the crisis there is no significant difference between the quality of the services provided by Big 4 and non-Big 4 auditors.

6. Conclusion

This study aims to ascertain in a combined way the impact of 2008 financial crisis and audit quality on earnings quality. This is an important issue as the onset of the financial crisis has raised doubts among regulators and investors regarding the quality of the financial statements and the services provided by the auditors, notably those of high quality, the Big 4. For that purpose, we use the Kothari et al. (2005) model to construct a proxy of earnings quality and a sample of listed firms from 14 countries belonging to the European Union during the period from 2006 to 2016.

We find a significant improvement of earnings quality during the financial crisis period comparing with the pre-crisis period, suggesting that managers had incentives to improve earnings quality in order to increase investor confidence, attract potential investors and reduce the negative effects of the crisis. Moreover, we also report that during the post-crisis period, earnings quality was even better than it had been in the crisis period. Overall, the earnings quality was higher in the post-crisis period than in the pre-crisis period. This result may be due to the various recovery and crisis prevention measures implemented in the EU.

Further, concerning the impact of audit quality on earnings quality, the results confirm the vast findings of previous literature showing that firms audited by one of the Big 4 exhibit higher earnings quality when compared to firms followed by non-Big 4 auditors. In addition, examining the effect of audit quality differentiation on earnings quality over the period of analysis, we found that during the post-crisis period there is no evidence of such differentiation between Big 4 and non-Big 4 auditors in constraining earnings management practices. This result suggests that non-Big 4 auditors have enhanced their practices during the financial crisis, thus reducing the quality differentiation between the two types of auditors.

Our results are partially robust after running some additional tests by using signed discretionary accruals and for two alternative subsamples.

This research has some limitations. We only use discretionary accruals calculated from the Kothari et al. (2005) model as a proxy for earnings quality. Future research could use other models to calculate earnings quality, such as conservatism, earnings persistence, value relevance, earnings predictability, loss avoidance, earnings smoothness and even

other models to calculate discretionary accruals. We also only use the size of the audit firm as proxy of audit quality, so this analysis would also be interesting with different proxies of audit quality. Moreover, since the existing literature about the earnings quality before, during and after the crisis in the EU is scarce, it would be interesting for other studies to corroborate our findings. The same applies in relation to the audit quality differentiation over these periods.

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